IBM Train and Test Model

```
ls
```

In [2]:

```
pwd
```

Out[2]:

```
'/home/wsuser/work'
```

In [8]:

```
!pip install keras==2.7.0
!pip install tensorflow==2.5.0
```

```
Collecting keras==2.7.0
  Using cached keras-2.7.0-py2.py3-none-any.whl (1.3 MB)
Installing collected packages: keras
  Attempting uninstall: keras
    Found existing installation: Keras 2.2.4
    Uninstalling Keras-2.2.4:
      Successfully uninstalled Keras-2.2.4
Successfully installed keras-2.7.0
Requirement already satisfied: tensorflow==2.5.0 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (2.5.0)
Requirement already satisfied: protobuf>=3.9.2 in /opt/conda/envs/Python-3.
9/lib/python3.9/site-packages (from tensorflow==2.5.0) (3.19.1)
Requirement already satisfied: h5py~=3.1.0 in /opt/conda/envs/Python-3.9/li
b/python3.9/site-packages (from tensorflow==2.5.0) (3.1.0)
Requirement already satisfied: astunparse~=1.6.3 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.6.3)
Requirement already satisfied: keras-nightly~=2.5.0.dev in /opt/conda/envs/
Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (2.5.0.dev2
021032900)
Requirement already satisfied: termcolor~=1.1.0 in /opt/conda/envs/Python-3
.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.1.0)
Requirement already satisfied: flatbuffers~=1.12.0 in /opt/conda/envs/Pytho
n-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.12)
Requirement already satisfied: wrapt~=1.12.1 in /opt/conda/envs/Python-3.9/
lib/python3.9/site-packages (from tensorflow==2.5.0) (1.12.1)
Requirement already satisfied: six~=1.15.0 in /opt/conda/envs/Python-3.9/li
b/python3.9/site-packages (from tensorflow==2.5.0) (1.15.0)
Requirement already satisfied: tensorflow-estimator<2.6.0,>=2.5.0rc0 in /op
t/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0
) (2.5.0)
Requirement already satisfied: typing-extensions~=3.7.4 in /opt/conda/envs/
Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (3.7.4.3)
Requirement already satisfied: keras-preprocessing~=1.1.2 in /opt/conda/env
s/Python-3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.1.2)
Requirement already satisfied: absl-py~=0.10 in /opt/conda/envs/Python-3.9/
lib/python3.9/site-packages (from tensorflow==2.5.0) (0.12.0)
Requirement already satisfied: grpcio~=1.34.0 in /opt/conda/envs/Python-3.9
/lib/python3.9/site-packages (from tensorflow==2.5.0) (1.34.1)
Requirement already satisfied: numpy~=1.19.2 in /opt/conda/envs/Python-3.9/
lib/python3.9/site-packages (from tensorflow==2.5.0) (1.19.5)
Requirement already satisfied: google-pasta~=0.2 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (0.2.0)
Requirement already satisfied: wheel~=0.35 in /opt/conda/envs/Python-3.9/li
b/python3.9/site-packages (from tensorflow==2.5.0) (0.37.0)
```

```
Requirement already satisfied: opt-einsum~=3.3.0 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (3.3.0)
Requirement already satisfied: gast==0.4.0 in /opt/conda/envs/Python-3.9/li
b/python3.9/site-packages (from tensorflow==2.5.0) (0.4.0)
Requirement already satisfied: tensorboard~=2.5 in /opt/conda/envs/Python-3
.9/lib/python3.9/site-packages (from tensorflow==2.5.0) (2.7.0)
Requirement already satisfied: google-auth<3,>=1.6.3 in /opt/conda/envs/Pyt
hon-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5
.0) (1.23.0)
Requirement already satisfied: markdown>=2.6.8 in /opt/conda/envs/Python-3.
9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0) (3
.3.3)
Requirement already satisfied: werkzeug>=0.11.15 in /opt/conda/envs/Python-
3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0)
(2.0.2)
Requirement already satisfied: tensorboard-data-server<0.7.0,>=0.6.0 in /op
t/conda/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5-
>tensorflow==2.5.0) (0.6.1)
Requirement already satisfied: tensorboard-plugin-wit>=1.6.0 in /opt/conda/
envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorf
low==2.5.0) (1.6.0)
Requirement already satisfied: setuptools>=41.0.0 in /opt/conda/envs/Python
-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0)
(58.0.4)
Requirement already satisfied: requests<3,>=2.21.0 in /opt/conda/envs/Pytho
n-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tensorflow==2.5.0
) (2.26.0)
Requirement already satisfied: google-auth-oauthlib<0.5,>=0.4.1 in /opt/con
da/envs/Python-3.9/lib/python3.9/site-packages (from tensorboard~=2.5->tens
orflow==2.5.0) (0.4.4)
Requirement already satisfied: pyasn1-modules>=0.2.1 in /opt/conda/envs/Pyt
hon-3.9/lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboar
d~=2.5->tensorflow==2.5.0) (0.2.8)
Requirement already satisfied: cachetools<5.0,>=2.0.0 in /opt/conda/envs/Py
thon-3.9/lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboa
rd~=2.5->tensorflow==2.5.0) (4.2.2)
Requirement already satisfied: rsa<5,>=3.1.4 in /opt/conda/envs/Python-3.9/
lib/python3.9/site-packages (from google-auth<3,>=1.6.3->tensorboard~=2.5->
tensorflow==2.5.0) (4.7.2)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /opt/conda/envs/
Python-3.9/lib/python3.9/site-packages (from google-auth-oauthlib<0.5,>=0.4
.1->tensorboard~=2.5->tensorflow==2.5.0) (1.3.0)
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /opt/conda/envs/Pyth
on-3.9/lib/python3.9/site-packages (from pyasn1-modules>=0.2.1->google-auth
<3,>=1.6.3->tensorboard~=2.5->tensorflow==2.5.0) (0.4.8)
Requirement already satisfied: charset-normalizer~=2.0.0 in /opt/conda/envs
/Python-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorbo
ard~=2.5->tensorflow==2.5.0) (2.0.4)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/envs/Python
-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~=2.
5->tensorflow==2.5.0) (2022.9.24)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python-3.9/l
ib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~=2.5->ten
sorflow==2.5.0) (3.3)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in /opt/conda/envs/Pyt
hon-3.9/lib/python3.9/site-packages (from requests<3,>=2.21.0->tensorboard~
=2.5->tensorflow==2.5.0) (1.26.7)
```

```
Requirement already satisfied: oauthlib>=3.0.0 in /opt/conda/envs/Python-3.
9/lib/python3.9/site-packages (from requests-oauthlib>=0.7.0->google-auth-o
authlib<0.5,>=0.4.1->tensorboard~=2.5->tensorflow==2.5.0) (3.2.1)
```

Image Augmentation

In [9]:

```
from tensorflow.keras.preprocessing.image import ImageDataGenerator
```

In [10]:

```
train_datagen=ImageDataGenerator(rescale=1./255,zoom_range=0.2,horizontal_f
lip=True,vertical_flip=False)
```

In [11]:

```
test_datagen=ImageDataGenerator(rescale=1./255)
```

In [12]:

```
ls
```

In [13]:

```
pwd
```

Out[13]:

```
'/home/wsuser/work'
```

In [14]:

```
import os, types
import pandas as pd
from botocore.client import Config
import ibm_boto3

def __iter__(self): return 0

# @hidden_cell
# The following code accesses a file in your IBM Cloud Object Storage. It
includes your credentials.
# You might want to remove those credentials before you share the notebook.
client_4ff9f1114db24196a9abd4f5c1f0b60a =
ibm_boto3.client(service_name='s3',
    ibm_api_key_id='j4lNXssktSSxQiDx3pbNR_eFi1SMCDE6MFnBQ_EmNCDM',
    ibm_auth_endpoint="https://iam.cloud.ibm.com/oidc/token",
    config=Config(signature_version='oauth'),
    endpoint_url='https://s3.private.us.cloud-object-
storage.appdomain.cloud')

streaming_body_1 =
client_4ff9f1114db24196a9abd4f5c1f0b60a.get_object(Bucket='trainmodel-
donotdelete-pr-cbqe37eh8gzesa', Key='fruit-dataset.zip')['Body']

# Your data file was loaded into a botocore.response.StreamingBody object.
# Please read the documentation of ibm_boto3 and pandas to learn more about
the possibilities to load the data.
# ibm_boto3 documentation: https://ibm.github.io/ibm-cos-sdk-python/
# pandas documentation: http://pandas.pydata.org/
```

In [15]:

```
from io import BytesIO
import zipfile
unzip = zipfile.ZipFile(BytesIO(streaming_body_1.read()), "r")
```

```
file_paths = unzip.namelist()
for path in file_paths:
    unzip.extract(path)
```

In [16]:

```
pwd
```

Out[16]:

```
'/home/wsuser/work'
```

In [17]:

```
import os
filenames = os.listdir('/home/wsuser/work/fruit-dataset/train')
```

In [18]:

```
x_train=train_datagen.flow_from_directory("/home/wsuser/work/fruit-
dataset/train",target_size=(128,128),class_mode='categorical',batch_size=24
)
```

```
Found 5384 images belonging to 6 classes.
```

In [ ]:

In [19]:

```
x_test=test_datagen.flow_from_directory(r"/home/wsuser/work/fruit-
dataset/test",target_size=(128,128),

class_mode='categorical',batch_size=24)
```

```
Found 1686 images belonging to 6 classes.
```

In [20]:

```
x_train.class_indices
```

Out[20]:

```
{'Apple___Black_rot': 0,
 'Apple___healthy': 1,
 'Corn_(maize)___Northern_Leaf_Blight': 2,
 'Corn_(maize)___healthy': 3,
 'Peach___Bacterial_spot': 4,
 'Peach___healthy': 5}
```

CNN

In [21]:

```
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import
Dense,Convolution2D,MaxPooling2D,Flatten
```

In [24]:

```
model=Sequential()
```

In [25]:

```
model.add(Convolution2D(32,(3,3),input_shape=(128,128,3),activation='relu')
)
```

In [26]:

```
model.add(MaxPooling2D(pool_size=(2,2)))
```

In [27]:

```
model.add(Flatten())
```

In [28]:

```
model.summary()
```

```
Model: "sequential_1"
_________________________________________________________________
 Layer (type)                 Output Shape              Param #
=================================================================
 conv2d_1 (Conv2D)            (None, 126, 126, 32)      896

 max_pooling2d (MaxPooling2D  (None, 63, 63, 32)       0
 )

 flatten (Flatten)            (None, 127008)            0

=================================================================
Total params: 896
Trainable params: 896
Non-trainable params: 0
_________________________________________________________________
```

In [29]:

```
32*(3*3*3+1)
```

Out[29]:

```
896
```

Hidden Layers

In [30]:

```
model.add(Dense(300,activation='relu'))
model.add(Dense(150,activation='relu'))
```

Output Layer

In [31]:

```
model.add(Dense(6,activation='softmax'))
```

In [32]:

```
model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['ac
curacy'])
```

In [33]:

```
len(x_train)
```

Out[33]:

```
225
```

In [34]:

```
1238/24
```

Out[34]:

```
51.583333333333336
```

In [35]:

```
model.fit_generator(x_train,steps_per_epoch=len(x_train),validation_data=x_
test,validation_steps=len(x_test),epochs=10)
```

```
/tmp/wsuser/ipykernel_164/1582812018.py:1: UserWarning: `Model.fit_generato
r` is deprecated and will be removed in a future version. Please use `Model
.fit`, which supports generators.
  model.fit_generator(x_train,steps_per_epoch=len(x_train),validation_data=
x_test,validation_steps=len(x_test),epochs=10)
Epoch 1/10
225/225 [==============================] - 118s 520ms/step - loss: 0.8920 -
accuracy: 0.8094 - val_loss: 0.2273 - val_accuracy: 0.9235
Epoch 2/10
225/225 [==============================] - 116s 515ms/step - loss: 0.2367 -
accuracy: 0.9179 - val_loss: 0.2056 - val_accuracy: 0.9324
Epoch 3/10
225/225 [==============================] - 116s 517ms/step - loss: 0.1970 -
accuracy: 0.9337 - val_loss: 0.4972 - val_accuracy: 0.8754
Epoch 4/10
225/225 [==============================] - 117s 521ms/step - loss: 0.1688 -
accuracy: 0.9422 - val_loss: 0.2279 - val_accuracy: 0.9217
Epoch 5/10
225/225 [==============================] - 116s 516ms/step - loss: 0.1438 -
accuracy: 0.9487 - val_loss: 0.1685 - val_accuracy: 0.9484
Epoch 6/10
225/225 [==============================] - 117s 518ms/step - loss: 0.1362 -
accuracy: 0.9556 - val_loss: 0.1176 - val_accuracy: 0.9662
Epoch 7/10
225/225 [==============================] - 116s 515ms/step - loss: 0.1282 -
accuracy: 0.9590 - val_loss: 0.5466 - val_accuracy: 0.8387
Epoch 8/10
225/225 [==============================] - 116s 514ms/step - loss: 0.1282 -
accuracy: 0.9597 - val_loss: 0.1194 - val_accuracy: 0.9620
Epoch 9/10
225/225 [==============================] - 116s 514ms/step - loss: 0.1141 -
accuracy: 0.9616 - val_loss: 0.1478 - val_accuracy: 0.9508
Epoch 10/10
225/225 [==============================] - 116s 516ms/step - loss: 0.0927 -
accuracy: 0.9695 - val_loss: 0.0772 - val_accuracy: 0.9751
```

Out[35]:

Saving Model

In [36]:

```
ls
```

```
fruit-dataset/
```

In [37]:

```
model.save('fruit.h5')
```

In [40]:

```
!tar -zcvf Train-model_new.tgz fruit.h5
```

```
fruit.h5
```

In [39]:

```
ls -1
```

```
fruit-dataset/
fruit.h5
Train-model_new.tgz
```

IBM Cloud Deployment Model

In [41]:

```
!pip install watson-machine-learning-client --upgrade
```

```
Collecting watson-machine-learning-client
  Downloading watson_machine_learning_client-1.0.391-py3-none-any.whl (538
kB)
     |████████████████████████████████| 538 kB 21.2 MB/s eta 0:00:01
Requirement already satisfied: tqdm in /opt/conda/envs/Python-3.9/lib/pytho
n3.9/site-packages (from watson-machine-learning-client) (4.62.3)
Requirement already satisfied: certifi in /opt/conda/envs/Python-3.9/lib/py
thon3.9/site-packages (from watson-machine-learning-client) (2022.9.24)
Requirement already satisfied: requests in /opt/conda/envs/Python-3.9/lib/p
ython3.9/site-packages (from watson-machine-learning-client) (2.26.0)
Requirement already satisfied: tabulate in /opt/conda/envs/Python-3.9/lib/p
ython3.9/site-packages (from watson-machine-learning-client) (0.8.9)
Requirement already satisfied: ibm-cos-sdk in /opt/conda/envs/Python-3.9/li
b/python3.9/site-packages (from watson-machine-learning-client) (2.11.0)
Requirement already satisfied: pandas in /opt/conda/envs/Python-3.9/lib/pyt
hon3.9/site-packages (from watson-machine-learning-client) (1.3.4)
Requirement already satisfied: lomond in /opt/conda/envs/Python-3.9/lib/pyt
hon3.9/site-packages (from watson-machine-learning-client) (0.3.3)
Requirement already satisfied: boto3 in /opt/conda/envs/Python-3.9/lib/pyth
on3.9/site-packages (from watson-machine-learning-client) (1.18.21)
Requirement already satisfied: urllib3 in /opt/conda/envs/Python-3.9/lib/py
thon3.9/site-packages (from watson-machine-learning-client) (1.26.7)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /opt/conda/envs/Py
thon-3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning-c
lient) (0.10.0)
Requirement already satisfied: s3transfer<0.6.0,>=0.5.0 in /opt/conda/envs/
Python-3.9/lib/python3.9/site-packages (from boto3->watson-machine-learning
-client) (0.5.0)
Requirement already satisfied: botocore<1.22.0,>=1.21.21 in /opt/conda/envs
/Python-3.9/lib/python3.9/site-packages (from boto3->watson-machine-learnin
g-client) (1.21.41)
Requirement already satisfied: python-dateutil<3.0.0,>=2.1 in /opt/conda/en
vs/Python-3.9/lib/python3.9/site-packages (from botocore<1.22.0,>=1.21.21->
boto3->watson-machine-learning-client) (2.8.2)
Requirement already satisfied: six>=1.5 in /opt/conda/envs/Python-3.9/lib/p
ython3.9/site-packages (from python-dateutil<3.0.0,>=2.1->botocore<1.22.0,>
=1.21.21->boto3->watson-machine-learning-client) (1.15.0)
Requirement already satisfied: ibm-cos-sdk-core==2.11.0 in /opt/conda/envs/
Python-3.9/lib/python3.9/site-packages (from ibm-cos-sdk->watson-machine-le
arning-client) (2.11.0)
Requirement already satisfied: ibm-cos-sdk-s3transfer==2.11.0 in /opt/conda
/envs/Python-3.9/lib/python3.9/site-packages (from ibm-cos-sdk->watson-mach
ine-learning-client) (2.11.0)
Requirement already satisfied: charset-normalizer~=2.0.0 in /opt/conda/envs
/Python-3.9/lib/python3.9/site-packages (from requests->watson-machine-lear
ning-client) (2.0.4)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/envs/Python-3.9/l
ib/python3.9/site-packages (from requests->watson-machine-learning-client)
(3.3)
```

```
Requirement already satisfied: pytz>=2017.3 in /opt/conda/envs/Python-3.9/l
ib/python3.9/site-packages (from pandas->watson-machine-learning-client) (2
021.3)
Requirement already satisfied: numpy>=1.17.3 in /opt/conda/envs/Python-3.9/
lib/python3.9/site-packages (from pandas->watson-machine-learning-client) (
1.19.5)
Installing collected packages: watson-machine-learning-client
Successfully installed watson-machine-learning-client-1.0.391
```

In [43]:

```
from ibm_watson_machine_learning import APIClient

wml_credentials = {
                    "url": "https://us-south.ml.cloud.ibm.com",
                   "apikey":"0P3XkyCFYqABnc48BNG2ReoGAJy-oDXDRuULl4Y_zFxa"
                  }

client = APIClient(wml_credentials)
```

In [44]:

```
client = APIClient(wml_credentials)
```

In [45]:

```
def guid_from_space_name(client, space_name):
    space = client.spaces.get_details()
    return(next(item for item in space['resources'] if
item['entity']["name"]==space_name)['metadata']['id'])
```

In [46]:

```
space_uid = guid_from_space_name(client, 'Trainmodel')
print("Space UID = " + space_uid)
```

```
Space UID = 616c7d74-e99b-4c09-9922-27394a62c2d0
```

In [47]:

```
client.set.default_space(space_uid)
```

Out[47]:

```
'SUCCESS'
```

In [48]:

```
client.software_specifications.list()
```

```
------------------------------  ------------------------------------  ----
NAME                            ASSET_ID                              TYPE
default_py3.6                   0062b8c9-8b7d-44a0-a9b9-46c416adcbd9  base
kernel-spark3.2-scala2.12       020d69ce-7ac1-5e68-ac1a-31189867356a  base
pytorch-onnx_1.3-py3.7-edt      069ea134-3346-5748-b513-49120e15d288  base
scikit-learn_0.20-py3.6         09c5a1d0-9c1e-4473-a344-eb7b665ff687  base
spark-mllib_3.0-scala_2.12      09f4cff0-90a7-5899-b9ed-1ef348aebdee  base
pytorch-onnx_rt22.1-py3.9       0b848dd4-e681-5599-be41-b5f6fccc6471  base
ai-function_0.1-py3.6           0cdb0f1e-5376-4f4d-92dd-da3b69aa9bda  base
shiny-r3.6                      0e6e79df-875e-4f24-8ae9-62dcc2148306  base
tensorflow_2.4-py3.7-horovod    1092590a-307d-563d-9b62-4eb7d64b3f22  base
pytorch_1.1-py3.6               10ac12d6-6b30-4ccd-8392-3e922c096a92  base
tensorflow_1.15-py3.6-ddl       111e41b3-de2d-5422-a4d6-bf776828c4b7  base
runtime-22.1-py3.9              12b83a17-24d8-5082-900f-0ab31fbfd3cb  base
scikit-learn_0.22-py3.6         154010fa-5b3b-4ac1-82af-4d5ee5abbc85  base
default_r3.6                    1b70aec3-ab34-4b87-8aa0-a4a3c8296a36  base
pytorch-onnx_1.3-py3.6          1bc6029a-cc97-56da-b8e0-39c3880dbbe7  base
kernel-spark3.3-r3.6            1c9e5454-f216-59dd-a20e-474a5cdf5988  base
pytorch-onnx_rt22.1-py3.9-edt   1d362186-7ad5-5b59-8b6c-9d0880bde37f  base
```

```
tensorflow_2.1-py3.6           1eb25b84-d6ed-5dde-b6a5-3fbdf1665666  base
spark-mllib_3.2                20047f72-0a98-58c7-9ff5-a77b012eb8f5  base
tensorflow_2.4-py3.8-horovod   217c16f6-178f-56bf-824a-b19f20564c49  base
runtime-22.1-py3.9-cuda        26215f05-08c3-5a41-a1b0-da66306ce658  base
do_py3.8                       295addb5-9ef9-547e-9bf4-92ae3563e720  base
autoai-ts_3.8-py3.8            2aa0c932-798f-5ae9-abd6-15e0c2402fb5  base
tensorflow_1.15-py3.6          2b73a275-7cbf-420b-a912-eae7f436e0bc  base
kernel-spark3.3-py3.9          2b7961e2-e3b1-5a8c-a491-482c8368839a  base
pytorch_1.2-py3.6              2c8ef57d-2687-4b7d-acce-01f94976dac1  base
spark-mllib_2.3                2e51f700-bca0-4b0d-88dc-5c6791338875  base
pytorch-onnx_1.1-py3.6-edt     32983cea-3f32-4400-8965-dde874a8d67e  base
spark-mllib_3.0-py37           36507ebe-8770-55ba-ab2a-eafe787600e9  base
spark-mllib_2.4                390d21f8-e58b-4fac-9c55-d7ceda621326  base
xgboost_0.82-py3.6             39e31acd-5f30-41dc-ae44-60233c80306e  base
pytorch-onnx_1.2-py3.6-edt     40589d0e-7019-4e28-8daa-fb03b6f4fe12  base
default_r36py38                41c247d3-45f8-5a71-b065-8580229facf0  base
autoai-ts_rt22.1-py3.9         4269d26e-07ba-5d40-8f66-2d495b0c71f7  base
autoai-obm_3.0                 42b92e18-d9ab-567f-988a-4240ba1ed5f7  base
pmml-3.0_4.3                   493bcb95-16f1-5bc5-bee8-81b8af80e9c7  base
spark-mllib_2.4-r_3.6          49403dff-92e9-4c87-a3d7-a42d0021c095  base
xgboost_0.90-py3.6             4ff8d6c2-1343-4c18-85e1-689c965304d3  base
pytorch-onnx_1.1-py3.6         50f95b2a-bc16-43bb-bc94-b0bed208c60b  base
autoai-ts_3.9-py3.8            52c57136-80fa-572e-8728-a5e7cbb42cde  base
spark-mllib_2.4-scala_2.11     55a70f99-7320-4be5-9fb9-9edb5a443af5  base
spark-mllib_3.0                5c1b0ca2-4977-5c2e-9439-ffd44ea8ffe9  base
autoai-obm_2.0                 5c2e37fa-80b8-5e77-840f-d912469614ee  base
spss-modeler_18.1              5c3cad7e-507f-4b2a-a9a3-ab53a21dee8b  base
cuda-py3.8                     5d3232bf-c86b-5df4-a2cd-7bb870a1cd4e  base
autoai-kb_3.1-py3.7            632d4b22-10aa-5180-88f0-f52dfb6444d7  base
pytorch-onnx_1.7-py3.8         634d3cdc-b562-5bf9-a2d4-ea90a478456b  base
spark-mllib_2.3-r_3.6          6586b9e3-ccd6-4f92-900f-0f8cb2bd6f0c  base
tensorflow_2.4-py3.7           65e171d7-72d1-55d9-8ebb-f813d620c9bb  base
spss-modeler_18.2              687eddc9-028a-4117-b9dd-e57b36f1efa5  base
------------------------------  ------------------------------------  ----
Note: Only first 50 records were displayed. To display more use 'limit' par
ameter.
```

In [51]:

```
software_space_uid =
client.software_specifications.get_uid_by_name("tensorflow_rt22.1-py3.9")
software_spec_uid
```

Out[51]:

```
'1eb25b84-d6ed-5dde-b6a5-3fbdf1665666'
```

In [54]:

```
 ls
```

```
fruit-dataset/  fruit.h5  Train-model_new.tgz
```

In [56]:

```
model_details = client.repository.store_model(model= 'Train-model_new.tgz',
    meta_props={
        client.repository.ModelMetaNames.NAME:"CNN",
        client.repository.ModelMetaNames.TYPE:"tensorflow_2.7",

client.repository.ModelMetaNames.SOFTWARE_SPEC_UID:software_space_uid}
    )
```

In [57]:

```
model_id = client.repository.get_model_id(model_details)
```

In [58]:

```
model_id
```

Out[58]:

```
'd0aeb6a2-e89c-4f8d-bf2f-a28ca4ea3cca'
```

In [60]:

```
ls
```

```
fruit-dataset/  fruit.h5  Train-model_new.tgz
```

Test The Model

In [54]:

```
import numpy as np
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
```

In [55]:

```
model=load_model('fruit.h5')
```

In [68]:

```
img=image.load_img(r"C:\Users\Sree Ram\Desktop\ibm\Dataset Plant
Disease\fruit-dataset\fruit-dataset\test\Apple___healthy\0adc1c5b-8958-
47c0-a152-f28078c214f1___RS_HL 7825.JPG")
```

In [69]:

```
img
```

Out[69]:

In [70]:

```
img=image.load_img(r"C:\Users\Sree Ram\Desktop\ibm\Dataset Plant
Disease\fruit-dataset\fruit-dataset\test\Apple___healthy\0adc1c5b-8958-
47c0-a152-f28078c214f1___RS_HL 7825.JPG",target_size=(128,128))
img
```

Out[70]:

In [71]:

```
x=image.img_to_array(img)
```

In [72]:

```
x
```

Out[72]:

```
array([[[ 99.,  86., 106.],
        [101.,  88., 108.],
        [118., 105., 125.],
        ...,
        [ 92.,  83., 102.],
        [ 93.,  84., 103.],
        [ 89.,  80.,  99.]],

       [[ 96.,  83., 103.],
        [ 87.,  74.,  94.],
        [102.,  89., 109.],
        ...,
        [ 88.,  79.,  98.],
        [ 89.,  80.,  99.],
        [ 83.,  74.,  93.]],

       [[ 86.,  73.,  93.],
        [ 88.,  75.,  95.],
        [ 98.,  85., 105.],
        ...,
        [107.,  98., 117.],
        [ 96.,  87., 106.],
        [ 96.,  87., 106.]],

       ...,

       [[172., 175., 194.],
        [173., 176., 195.],
        [175., 178., 197.],
        ...,
        [179., 180., 198.],
        [184., 185., 203.],
        [179., 180., 198.]],

       [[172., 175., 194.],
        [170., 173., 192.],
        [173., 176., 195.],
        ...,
        [178., 179., 197.],
        [182., 183., 201.],
        [178., 179., 197.]],

       [[169., 172., 191.],
```

```
        [166., 169., 188.],
        [168., 171., 190.],
        ...,
        [187., 188., 206.],
        [185., 186., 204.],
        [186., 187., 205.]]], dtype=float32)
```

In [73]:

```
x=np.expand_dims(x,axis=0)
```

In [74]:

```
x
```

Out[74]:

```
array([[[[ 99.,  86., 106.],
         [101.,  88., 108.],
         [118., 105., 125.],
         ...,
         [ 92.,  83., 102.],
         [ 93.,  84., 103.],
         [ 89.,  80.,  99.]],

        [[ 96.,  83., 103.],
         [ 87.,  74.,  94.],
         [102.,  89., 109.],
         ...,
         [ 88.,  79.,  98.],
         [ 89.,  80.,  99.],
         [ 83.,  74.,  93.]],

        [[ 86.,  73.,  93.],
         [ 88.,  75.,  95.],
         [ 98.,  85., 105.],
         ...,
         [107.,  98., 117.],
         [ 96.,  87., 106.],
         [ 96.,  87., 106.]],

        ...,

        [[172., 175., 194.],
         [173., 176., 195.],
         [175., 178., 197.],
         ...,
         [179., 180., 198.],
         [184., 185., 203.],
         [179., 180., 198.]],

        [[172., 175., 194.],
         [170., 173., 192.],
         [173., 176., 195.],
         ...,
         [178., 179., 197.],
         [182., 183., 201.],
         [178., 179., 197.]],

        [[169., 172., 191.],
         [166., 169., 188.],
```

```
         [168., 171., 190.],
         ...,
         [187., 188., 206.],
         [185., 186., 204.],
         [186., 187., 205.]]]], dtype=float32)
```

In [75]:

```
y=np.argmax(model.predict(x),axis=1)
```

```
1/1 [==============================] - 0s 105ms/step
```

In [76]:

```
x_train.class_indices
```

Out[76]:

```
{'Apple___Black_rot': 0,
 'Apple___healthy': 1,
 'Corn_(maize)___Northern_Leaf_Blight': 2,
 'Corn_(maize)___healthy': 3,
 'Peach___Bacterial_spot': 4,
 'Peach___healthy': 5}
```

In [77]:

```
index=['Apple___Black_rot','Apple___healthy','Corn_(maize)___Northern_Leaf_
Blight','Corn_(maize)___healthy','Peach___Bacterial_spot','Peach___healthy'
]
```

In [78]:

```
index[y[0]]
```

Out[78]:

```
'Apple___healthy'
```

In [82]:

```
img=image.load_img(r"C:\Users\Sree Ram\Desktop\ibm\Dataset Plant
Disease\fruit-dataset\fruit-dataset\test\Peach___healthy\0a2ed402-5d23-
4e8d-bc98-b264aea9c3fb___Rutg._HL 2471.JPG",target_size=(128,128))
x=image.img_to_array(img)
x=np.expand_dims(x,axis=0)
y=np.argmax(model.predict(x),axis=1)
index=['Apple___Black_rot','Apple___healthy','Corn_(maize)___Northern_Leaf_
Blight','Corn_(maize)___healthy','Peach___Bacterial_spot','Peach___healthy'
]
index[y[0]]
```

```
1/1 [==============================] - 0s 26ms/step
```

Out[82]:

```
'Corn_(maize)___healthy'
```

In [83]:

```
import os
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
from flask import Flask,render_template,request
```

In [61]:

```
app=Flask(__name__)

model=load_model("fruit.h5")

@app.route('/')
def index():
    return render_template("index.html")
```

```
@app.route('/predict',methods=['GET','POST'])
def upload():
    if request.method=='POST':
        f=request.files['image']
        basepath=os.path.dirname('__file__')
        filepath=os.path.join(basepath,'uploads',f.filename)
        f.save(filepath)
        img=image.load_img(filepath,target_size=(128,128))
        x=image.img_to_array(img)
        x=np.expand_dims(x,axis=0)
        pred=np.argmax(model.predict(x),axis=1)

index=['Apple___Black_rot','Apple___healthy','Corn_(maize)___Northern_Leaf_
Blight','Corn_(maize)___healthy','Peach___Bacterial_spot','Peach___healthy'
]
        text="The Classified Fruit disease is : " +str(index[pred[0]])
    return text
if __name__=='__main__':
    app.run(debug=False)
```

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
/tmp/wsuser/ipykernel_164/945920450.py in
----> 1 app=Flask(__name__)
      2
      3 model=load_model("fruit.h5")
      4
      5 @app.route('/')

NameError: name 'Flask' is not defined
```

In [ ]: